# Method of Test for CLASSIFICATION OF SOILS AND SOIL-AGGREGATE MIXTURES

DOTD Designation: TR423M/423-99

#### I. Scope

- A. This method describes the procedure for classifying soils and soil-aggregate mixtures by soil group, group index value, and textural name classification based on the results of laboratory tests. Materials which contain reclaimed or recycled asphaltic concrete, previously treated or stabilized soils, portland cement concrete, etc. shall not be classified by this procedure.
- B. Reference Documents
  - 1. DOTD TR 407, Mechanical Analysis of Soils
  - 2. DOTD TR 411, Dry Preparation of Disturbed Samples for Tests
  - 3. DOTD TR 413, Organic Material in Soils
  - 4. DOTD TR 428, Determining the Atterberg Limits of Soils

#### II Apparatus

Soils/Soil-Aggregate Worksheet (DOTD Form No. 03-22-0723), completed with results from the reference documents. (Figure 1)

## III. Sample

No sample is required for this procedure.

## IV. Procedure

- A. If the organic content determined in accordance with DOTD TR 413 is 15% or greater, classify the soil as A-8 with a textural classification of organic from Table 1.
- B. If the organic content is less than 15%, use the adjusted percentages passing the 2.00 mm (No. 10), 425 μm (No. 40), and 75 μm (No. 200) sieves determined in accordance with DOTD TR 407, the liquid limit and plasticity index determined in accordance with DOTD TR 428, to identify the soil group or subgroup by process of elimination proceeding from left to right in Table 1.
- Note 1: The correct group classification is the first group from the left into which the test data will fit.
  - C. Record the group and subgroup, if applicable, on the worksheet as "Group."

- D. Determine the group index value.
  - 1. For materials falling within groups A-1-a, A-1-b, A-2-4, A-2-5 and A-3, record the group index as zero (0) in parenthesis on the worksheet after the group classification.
  - 2. For all other group classifications, determine the group index in accordance with Steps V.A. and B. and record in parenthesis on the worksheet after the group classification.
- E. Determine the textural name classification using the unadjusted percent sand (from TR 407), the unadjusted percentage of silt (from TR 407), the unadjusted percent clay and colloids (from TR 407), and the triangular chart shown in Figure 2.
- Note 2: As designated in DOTD TR 407, the total of these percentages should total 100.
  - On the triangular chart (Figure 2), locate the intersection of the horizontal and diagonal lines corresponding to the unadjusted percentages of sand, silt, and clay and colloids.
  - 2. If the name classification falls on a borderline, apply the "to the right and up" rule as follows.
    - a. If the two textural names are adjacent horizontally, use the name on the right.
    - b. If the two names are adjacent vertically, use the top name.
- Note 3: If a sample contains zero (0) percent sand (100% passing the 75 μm [No. 200 sieve]), use the borderline classification rule of "to the left and up."
  - F. Determine the amount of coarse aggregate in the sample, using the percentages retained on the 25.0 mm (1 in), 19.0 mm (3/4 in)., 12.5 mm (1/2 in) 4.75 mm (No. 4), and 2.00 mm (No. 10) sieves determined in DOTD TR 407, in accordance with Step V. C.
  - G. If the value determined in Step F. is five percent or more, assign a prefix to the textural name that describes the type of coarse aggregate present.

- 1. If the coarse aggregate consists of aggregate other than shell, record "G" on the worksheet as "Classification Prefix" if the material is "siliceous" (specific gravity 2.564) or N if it is "nonsiliceous" to describe the type of coarse aggregate.
- 2. If the coarse aggregate is shell, record "S" on the worksheet as "Classification Prefix".
- H. If the organic content determined in accordance with DOTD TR 413 is from 3 through 14 percent, include "and organic" following the textural name.

#### V. Calculations

A. Calculate the group index values of A-2-6 and A-2--7 soils to the nearest whole number using the following equation:

Group Index = 
$$0.01 (F - 15)(PI - 10)$$

where:

F = adj. % passing the 75  $\mu$ m (No. 200) sieve PI = plasticity index

example:

F = 30PI = 30

Group Index = 0.01(30 - 15)(30 - 10)

= 0.01 (15) (20)

Group Index = 3

B. Calculate the group index values of A-4, A-5, A-6, A-7-5, and A-7-6 soils to the nearest whole number using the following equation:

Group Index =

F - 35)[0.2 + 0.005(LL - 40)] + 0.01 (F - 15)(PI - 10)

where:

F = matl. passing the 75μm (No. 200) sieve, %

LL = liquid limit

PI = plasticity index

example: an A-6 soil with:

F = 55 LL = 40 PI = 25

Group Index =

55 - 35[0.2 + 0.005(40 - 40)] + 0.01(55 - 15)(25 - 10)= 20[0.2 + 0] + 0.01(40)(15)= 4 + 6

Group Index = 10

C. Calculate the total amount of coarse aggregate in the sample by adding the individual percentages on the 25.0 mm (1 in), 19.0 mm (3/4 in), 12.5 mm (1/2 in), 4.75 mm (No. 4), and 2.00 mm (No. 10) sieve:

example:

25.0 mm = 019.0 mm = 6

12.5 mm = 2

 $4.75 \, \text{mm} = 5$ 

2.00 mm = 13

0 + 6 + 2 + 5 + 13 = 26%

### VI. Report

- A. Report all test results indicated by each test method used during classification of the sample. (Figure 1)
- B. Report the group classification followed by the group index value in parenthesis, as determined in Step IV.C. and D. Report group index values that were calculated to be negative as zero.
- C. Report the textural classification as determined in Step IV. E.
- D. Report the group classification of material containing 15% or more organic matter as A-8 and the textural name classification as "organic."

## VII. Normal Test Reporting Time

Normal test reporting time is three days.

TABLE 1

Classification of Soils and Soil-Aggregate Mixtures (With Suggested Subgroups)

General Classification	Granular Materials (35% or less passing 75 μm - No. 200)					00)		Silt-Clay Materials (More than 35% passing 75 μm -				Organic
Group Classification	A-1		A-3	A-		-2		A-4	A-5	A-6	A-7	A-8
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5: A-7-6	· · · · · · · · · · · · · · · · · · ·
Sieve Analysis: Percent Passing 2.00 mm (No. 10) 425 µm (No. 40) 75 µm (No. 200)		- 50 Max. 25 Max.	1	- - 35 Max.	- - 35 Max.	- - 35 Max.	- - 35 Max.	- - 36 Min.	- - 36 Min.	- - 36 Min.	- - 36 Min.	
Characteristics of Fraction Passing 425 µm (No. 40) Liquid Limit Plasticity Index	- 6 M	ax.	- N. P.	40 Max. 10 Max.		40 Max. 11 Min.		40 Max. 10 Max.			41 Min. 11 Min. *	- -
Usual Types of Significant Constituent Materials	Stone Fra Gravel ar		Fine Sand			Clayey and Sand		1	lty pils		Clayey Soils	15% or more Organic Matter
Gen. Rating as Subgrade		Exc	ellent to G	Good				Fair	to Poor			Unsuitable

<sup>\*</sup> Plasticity Index os A-7-5 subgroup is equal to or less than LL minus 30. Plasticity Index of A-7-6 subgroup is greater than LL minus 30

letric / Eng	glish 🔲 (M	or E - Located on MA	Louisiana Department o SOILS/SO TT Menu)	OIL-AGGREGATI	E .		DOTD 03-22-0723 Rev. 5/99		
roject No.	LLL	<u> </u>	Materia	I Code	Lat	. No. [ ] -	: تبلت		
	4.50		Submit	ted By		Quantity L			
urp. Code						c Code			
ate Tested		-111-111				sh No.			
rom Statio Iole No.	n LII	<u> </u>		+		ation LIII			
em No.			Depth, m (ft) [		v 11	Distance, km (mi)	<u> </u>		
	IRIE	TI 12151MIM	1=1 101%:1	1/21.5m	pled by:	10/1			
emarks 1		LII CIEIOIUI	SI AGGRI						
Hydromet	ter Analysis	(DOTD TR 407)	Graduate No			50.0, 2 = 100.0) _	·.		
Time	(T) Elapsed	Temp°C	(h)	(C)	Corrected	% Finer	Effect, Grain Size		
111116	Time	(0.5° increments)	Hydro Reading (0.5 increments)	Correction (0.5 increments)	Reading H = h - C	P = H × 100	$D = K \sqrt{\frac{L}{T}}$		
	60 Minutes	241.0	201.151	2			, ,		
	120 Minutes			131.0	17.5	35	0.0061		
	120 Minutes	211.0	19.0	131.151	15.5	31	0.0045		
	ON 2.00 m	nm (10).	Size !	Mass Retained (Wx	%	(DOTD	TR.407).		
	Method H) + Soil, q	<u> </u>	Laster	Gram	an series	% Ret. 25.0 mm (			
Cup No.			· Property of the second	Total Mass, g 3882					
Mass Soil			25.0 mm (1) 19.0 mm (3/4)	232		% Ret. 4.75 mm % Ret. 2.00 mm			
	ON 425 µr		12.5 mm (1/2)	9511		% Ret. 425 μm	(40) //		
	418 - Meth + Soil, g	181.4	4.75 mm (4)	100		% Ret. 75 μm (2 % Silt			
Cup No. Mass Cup			2.00 mm (10) 425 µm (40)	51/31	11/110	% Clay & Colloids			
Mass Soil		7.2	75 µm (200)		13.20	% Pass 2.00 mm % Pass 425 μm (4			
by a series of the series of t	ON 75 μm		% Silt	-	40.40	% Pass 75 μm (2 % Sand (Tot. Mat	00) 55		
(TR. 407 & 418 - Method H) Mass Cup + Soil, g Cup No Mass Cup, g  /201/			% Clay & Collois		40				
				Pass 4.75 mm (#4)					
Mass Soil,		Corto	% Organic Matt	or (TD 412)			y <u>32</u>		
LIQUID LI	MIT		Liquid Limit (TR 4			<u>Or</u>	¥		
No. Blows		होती	Plasticity Index				1		
Mass Cur	+ Wet So	il, g 34.13.1 1, g 27.1.6		Content, %(TR 40		لبا	101		
Mass Wa	ter, g	6.7	Maximum Densi	re Content, % (TR ty, kg/m <sup>3</sup> (lb/ft <sup>3</sup> ) (	418) TR 418)		<u> </u>		
Factor Cup No.	15	0.9931	Laboratory Com	paction Method (Tr	R 418)				
Mass Cup		1/100	% Cement (TR 43	32 or Plans)		11	101		
Mass Dry % Moistu		16.6	% Lime (TR 416)			ū			
PLASTIC			% Fly Ash % Other (Additiv	ve) Material C	ode LIT	Percent L			
Mass Cup	+ Wet So + Dry Soil	il, g 13161 131	Soil Group (TR 42	4 .	- 1.	r drount			
Mass Wat	ter, g	3.3	Classification (TF	1423) Grav. L	t. Silty Cr	4401g.			
Cup No. Mass Cup		1/1/10/21	pH (TR 430)	en de la Marie III de la composition de					
	Soil, g	22.0	Resistivity, ohm- Classification Pro		Siliceous Aggr.		ibail) (G)		
Mass Dry	re	15.0	(Required only if +2	2.00 mm [No.10] mate	rial equals or exce	eds 5%)	4		
Mass Dry % Moistu									
			111111						

Figure 1 Soils/Soil-Aggregate Worksheet (03-22-0723)

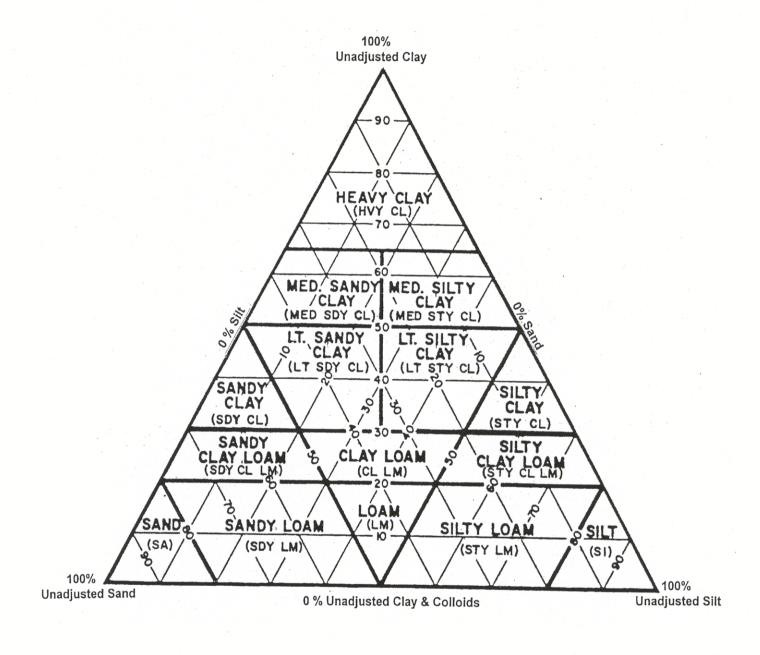


Figure 2

Triangular Chart